TRANSMITTAL OF APPEAL BRIEF (Large Entity)	Docket No. SAR 12428

In Re Application Of: **BERNARD DOV GELLER et al**

Serial No.	Filing Date	Examiner	Group Art Unit
09/430,642	October 29, 1999	S. Jones	2817

Invention: **HIGH PERFORMANCE EMBEDDED RF FILTERS**

TO THE ASSISTANT COMMISSIONER FOR PATENTS:

Transmitted herewith in triplicate is the Appeal Brief in this application, with respect to the Notice of Appeal filed on **12/ 6,/2001**

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☐ A check in the amount of the fee is enclosed.

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A duplicate copy of this sheet is enclosed.

Birgit E Morris

Signature

Dated: **February 6, 2002**

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I certify that this document and fee is being deposited on with the U.S. Postal Service as first class mail under 37 C.F.R. 1.8 and is addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

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Docket No. SAR 12428

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of

BERNARD DOV GELLER

Serial No.: 09/430,642 Examiner: S. Jones

Filed: October 29, 1999 Group Art Unit: 2817

For: HIGH PERFORMANCE EMBEDDED
RF FILTERS

BRIEF ON APPEAL

To: Assistant Commissioner for Patents
Washington, DC 20231

Sir:

This is an appeal from a Final Rejection dated July 6, 2001. A Notice of Appeal was filed December 6, 2001. Three copies of this Brief are attached. An Oral Hearing is requested. The fees for filing the Brief ($320.00) and for the Request for Oral Hearing ($280.00) are to be charged to Deposit Account 13-4542.

(1) REAL PARTY IN INTEREST

The real party in interest in this application is Sarnoff Corporation of 201 Washington Road, Princeton, NJ 08540, the assignee of 100% of the interest of this application.

(2) RELATED APPEALS AND INTERFERENCES

There are no appeals or interferences relating to this application, designated as Docket No. SAR 12428, or other related applications.

(3) STATUS OF CLAIMS

The claims are 1-3 and 6-10. Claims 1-3 have been withdrawn from consideration by the Examiner. In a response under 37 CFR 1.116, amendments were proffered to claims 9 and 10. In an Advisory Action dated December 11, 2001 the Examiner indicated that these amendments would be entered because the proposed amendments overcame the objections made in the previous office action. Thus the claims discussed in this Appeal Brief are 6-9 and 10-11 as amended.

(4) STATUS OF AMENDMENTS

The amendments submitted in response to the final rejection have been entered per the Examiner's Advisory Action dated December 11, 2001.

(5) SUMMARY OF THE INVENTION

The present invention is directed to embedded RF filters made from a green tape stack supported on a metal support substrate. Cavities are punched in the green tape stack, the

walls and bottom covered with a conductive layer, and a conductive layer formed over the cavities. The resonance of the cavities can be adjusted, as by choice of their size and the dielectric constant of the green tapes. E-plane probes are inserted into openings in the ground plane for connection with a microstrip transmission line.

(6) THE ISSUES

1) Whether claims 9, 6 and 8 are anticipated by Piloto et al, US Patent 5,382,931.

2) Whether claim 10 is unpatentable over Piloto et al.

3) Whether claim 7 is unpatentable over Piloto et al in view of Kubota et al, US Patent 6,137,384.

(7) GROUPING OF CLAIMS

The claims are all directed to embedded waveguide resonators or RF filters made from particular multilayer ceramics supported by a metal support substrate. Thus they will all be considered together.

(8) THE REJECTIONS

Claims 9, 6 and 8 have been rejected under 35 USC 102(a) over Piloto, US Patent 5,382,931. Claim 9, the independent claim, requires a metal support, a first green tape stack with a cavity

formed therein, a conductive layer over the first green tape stack, and a second green tape stack over the conductive layer.

Claim 6 requires that the cavities be rectangular.

Claim 8 requires that the embedded RF filter be able to be tuned to varying operating frequencies by choice of the dielectric constant of the green tapes.

Claim 10 has been rejected as unpatentable under 35 USC 103 over Piloto et al. Claim 10 requires that the metal support substrate be made of copper clad molybdenum.

Claim 7 has been rejected as unpatentable under 35 USC 103 over Piloto et al in view of Kubota et al, US Patent 6,137,384.

(9) THE ARGUMENT

Prior to making the present invention, researchers at the laboratories of the assignee have worked on glasses for green tapes to make printed circuit boards, and various utilities for these green tapes. A major invention in a series of patents related to these green tapes was the discovery that supporting a green tape stack with a metal support substrate, meant to strengthen the stack, not only gave mechanical support and strength to the printed circuit board, but, unexpectedly, shrinkage of the green tapes in the x and y dimensioins was

eliminated. Shrinkage of supported green tape stacks occur only in the "z", or thickness dimension, during firing. The green tape stack adheres to the metal plate during firing, and, even for green tape stacks many layers high (20 layers have been demonstrated) shrinkage of the green tapes occurs only in the "z" direction, but not in the x and y directions. This means for example that if modules of various types are to be electrically connected to these printed circuit boards, the area set aside for them on the board can be made much smaller, because the need for large tolerances that use up valuable board area are no longer needed. The result is that the printed circuit boards can be made smaller and lighter in weight.

In the present case, embedded RF filters are shown in Figs. 1 and 2. Fig. 2, a cross sectional view, shows a metal base 10, conductive walls and a ceramic stack. E-plane probes need to be matched to elements in the ceramic stack. Because the green tapes do not shrink in the plane of the probes, the electrical connections can be made without worrying about, or compensating for, shrinkage in the x and y dimensions. A green tape is punched to form a cavity which is covered with a conductive layer using a metallization ink. The green tapes that form the rest of the

device are laminated together, co-laminated to a metal base plate and co-fired. The resultant RF filters are embedded, not surface mounted. They can be made at low cost and they have improved performance.

Claim 9, and indeed all of the present claims, require a metal support substrate. Piloto et al disclose a waveguide filter made from a plurality of stacked high dielectric constant layers having vias therein and of a size so as to resonate at a predetermined frequency. The vias are filled with a conductive material, the top and bottom stack surfaces are plated with a conductive material, and the stack is fired. The ceramic layers of Piloto et al are not adhered to a metal support substrate. Piloto et al does not disclose a metal support plate at all, and thus appellants submit this reference does not anticipate these claims.

The Examiner points to a gold plated conductive layer on the bottom surface of the green tape stack of the reference, and states it would inherently provide support. Since this gold plated layer is very thin, as compared to a metal support plate, it does not provide mechanical strength as does appellants' metal support substrate. Further, appellants' metal support is in

addition to, not in place of, a conductive layer on the green tape stack.

Further, this gold plating layer does not prevent shrinkage in any direction; see col 6 lines 55-57 of the reference, which states that the green tapes shrink in all directions during firing to become a monolithic structure.

Piloto et al must trim or cut their ceramic multilayer module after firing to obtain the desired dimensions. This must be done by trial and error because their process is inherently non-controllable. As explained in col 4 lines 39-40 and 63-66, after firing, the ceramic structure must be cut to the desired final external dimensions. Thus the green tape stack is made about 12% larger than needed. However, the exact shrinkage can vary depending on the composition of the green tapes, the temperature and time of firing, and the like. Thus the shrinkage is not controllable or predictable. This trimming step is not required at all by appellants because the original dimensions in the x and y directions are retained after the firing step, and also the alignment of vias within the multilayer ceramic stack is retained after firing. Both dimensions and performance are improved. Appellants urge that the reference does not anticipate

the present claims because it does not have a metal support substrate. This lack is not trivial, as appellants have explained above.

Claim 10 has been held to be unpatentable over Piloto et al. Claim 10 also requires a metal support board, and further requires that this support be made of copper clad molybdenum. This support was chosen because it has a thermal coefficient of expansion thermally matched to the glasses and green tapes used to make the ceramic filter.

The Examiner's position is, that although Piloto et al do not disclose a copper clad molybdenum support substrate, that because it would be a mere substitution of an "art recognized equivalent conductive material" it would be obvious to use a metal clad molybdenum support instead of the gold plated conductive layer. This is not supportable; the metal clad molybdenum support board cannot be made by electroplating, and an electroplated layer does not substitute for the conductive gold layer, but is in addition to the conductive layer needed on the green tape stack.

As explained above, a thin gold plated layer would not give mechanical strength and support to a green tape stack. Further,

the question of shrinkage is ignored by the Examiner. Piloto et al state outright that their green tape stack shrinks in all directions during firing. Thus the gold plated layer does not in fact, nor would it be expected to, eliminate shrinkage during firing. Appellants do not concede that an electroplated metal layer used for its conductive properties can provide mechanical strength and support to a multilayer green tape stack, wherein some or all of the green tapes have circuitry printed thereon. The copper clad molybdenum board may be conductive, but it has other qualities lacking in an electroplated layer, particularly thickness and strength. The term "metal support substrate" is adequately described in the specification as providing support for, and preventing shrinkage of, a green tape stack.

Claim 7 has been rejected over Piloto et al in view of Kubota et al. Claim 7 requires an E-plane probe inserted through openings in a second green tape stack and connected to microstrip transmission lines on the surface of the second green tape stack.

Piloto et al do disclose communication between the RF filter and external electrodes through vias in green tapes. However, as the Examiner concedes, the reference does not disclose a probe

and transmission line. Thus the Examiner has added the Kubota et al reference. Fig. 7 of Kubota et al does show probes coupled to a dielectric resonator and to an external transmission circuit. However, Kubota et al is not directed to waveguide but dielectric resonator filters, dielectric duplexers and communication devices, and thus appellants submit no reason to combine these references except in light of appellants' own disclosure can be found within the references themselves. This is a classic hindsight type of rejection that has been rejected by this Board and the CAFC in numerous opinions as improper. See In re Fine et al, 5 USPQ 2nd, 1596 (CAFC, 1988). However, even if this Board disagrees, no metal support substrate for a green tape stack is disclosed, Kubota's "ground plate" is not flat, and there is a space between the ground plate and the overlying ceramic stack. Such a ground plate would not prevent shrinkage of the overlying green tapes during firing, as does the metal support plate of appellants. Thus Kubota et al does not supply the lack in the Piloto et al reference.

The Examiner also states that arguments relating to a lack of shrinkage are not relevant, since only the final product is patentable.

The Kubota et al reference does describe a ground plate, but it is not flat, and there is a space between the ground plate and the overlying ceramic. Such a ground plate would not prevent shrinkage of the overlying dielectric tapes during firing, as does the adhered metal support plate of appellants.

Appellants final product is the same size as the starting green tape package, because no shrinkage occurs during firing of the green tapes. This has great advantages in terms of electrical connections between the layers; because the layers do not shrink, the green tapes and their vias do not shift during firing, and thus the connections remain aligned during firing. Further, means of adding additional components, such as bond pads and the like on the surface of the ceramic stack can be made small, because large tolerances do not need to be provided. The final package as claimed will be smaller and lighter in weight, advantageous for example for hand held devices.

However, the lack of a metal support substrate must prove fatal to the Examiner's rejections and arguments.

SUMMARY

Appellants submit that the presently claimed devices are patentable over the references. The present claims are neither

anticipated by nor rendered unpatentable by the references of record. As discussed hereinabove, the rejections under 35 USC 102 and 103 should be overturned. Accordingly, appellants request that the rejections be reversed and the claims allowed.

Respectfully submitted,

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(10) APPENDIX

6. An embedded coupled waveguide resonator according to claim 9 wherein the shaped waveguide is rectangular.

7. An embedded dielectric waveguide according to claim 9 wherein E-plane probes are inserted through openings in said second of the two green tape stacks and connected to microstrip transmission lines on the surface of said second green tape stack.

8. An embedded dielectric waveguide according to claim 9 which is able to be tuned to varying operating frequencies by preselecting green tapes having varying dielectric constant into the structure.

9. An embedded coupled shaped dielectric waveguide resonator comprising

a metal support substrate,

a first green tape stack adhered to the support substrate,

cavity openings in the first green tape stack to provide walls and coupling apertures in the green tape stack,

a conductive layer over said first green tape stack, and

a second green tape stack mounted on said conductive layer.

10. An embedded coupled shaped dielectric waveguide resonator according to claim 9 wherein said metal support substrate is of copper clad molybdenum.